CONTROL OF ANNUAL GRASS WEEDS IN MAIZE

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Summary

Alachlor, propachlor and benthicarb alone, pre-emergent, and in combination with atrazine, post-emergent, were evaluated for grass weed control in maize grown on a range of soil types. Of the treatments tested, alachlor/atrazine was superior at a rate of 3.0/1.6 lb per acre, giving adequate weed control for seven weeks on soil containing up to 21% organic matter. It was concluded that, on moist soils, soil organic content was not a significant limiting factor.

INTRODUCTION

CUMBERLAND *et al.* (1970) reported that the acetanilides alachlor and propachlor when mixed with atrazine gave satisfactory control of grasses (and broadleaf weeds) except under dry conditions. However, the grass weed problem has arisen in areas where it was expected that soil type might also limit the efficacy of such mixtures.

Laboratory data (R. P. Upchurch and D. D. Baird, unpubl. rep., Monsanto Co., U.S.A.) indicate that the herbicidal activity of alachlor decreases as a linear function of increasing soil organic matter up to the 5 to 10% level. Above this there is no further effect. This rather surprising result was interpreted as suggesting that the possible limitation of high soil organic matter could be overcome by rate increment.

In 1970 the following trials were conducted to evaluate the field performance of alachlor in relation to soil organic matter (OM). Benthicarb, a carbamate herbicide, was included for screening purposes.

METHODS

Plots 24 ft × 10 ft (four 30 in. rows) were arranged in a randomized block design with four replicates. Treatments were applied by precision sprayer in 30 gal of water per acre at 40 lb/sq.in. and 2 mph.

Pre-emergence treatments were applied immediately after planting and post-emergence treatments when the weeds and crop were in the cotyledon stage. A nonionic surfactant (0.5%) was added to all post-emergence treatments.

Visual weed control assessments were made using a 1 to 10 scale (1 = no control, 10 = complete control). Yields are expressed as bushels of shelled grain per acre corrected to 15% moisture and treatments in lb active ingredient per acre.

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TRIAL 1

Maize var. PX 610 was planted on October 29 and treated on November 6. The soil was fine and moist. A moderate weed infestation was dominated by summer grass (*Digitaria sanguinalis*). There was a trace of rain seven days after treatment and a further 0.78 in. fall in the period 12 to 14 days after.

TABLE 1: POST-EMERGENCE APPLICATION, TAMAHARE,
HAMILTON
(Soil OM—10%)

Treatment (lb)	Rating		Yield (bu/ac)
	3 wk	7 wk	
atrazine 4	5.1	5.0	186
propachlor 3.9/atrazine 1.6	7.4	7.3	197
benthiocarb 2.5/atrazine 1.6	8.5	6.5	176
benthiocarb 5.0/atrazine 1.6	9.1	8.0	198
alachlor 2.0/atrazine 1.6	8.4	8.3	196
alachlor 3.0/atrazine 1.6	8.5	8.4	208
alachlor 4.0/atrazine 1.6	9.2	9.0	207
Control	1.0	1.0	161

TRIAL 2

Maize var. PX 610 was planted on October 28 and treated on November 6. The soil was fine and moist. A heavy weed infestation was dominated by witchgrasses (*Panicum* spp.). There was a trace of rain seven days after treatment and 0.78 in. fell in the period 12 to 14 days after.

TABLE 2: POST-EMERGENCE APPLICATION, MONAVALLE,
HAMILTON
(Soil OM—21%)

Treatment (lb)	Rating		Yield (bu/ac)
	3 wk	7 wk	
atrazine 4	5.1	4.0	163 aA
propachlor 3.9/atrazine 1.6	7.1	4.5	147 aA
benthiocarb 2.5/atrazine 1.6	6.9	4.8	155 aA
benthiocarb 5.0/atrazine 1.6	7.5	5.3	155 aA
alachlor 2.0/atrazine 1.6	8.5	7.5	161 aA
alachlor 3.0/atrazine 1.6	8.4	7.8	160 aA
alachlor 4.0/atrazine 1.6	9.6	9.0	165 aA
Control	1.0	1.0	60 bB
CV			26%

These two trials were laid down on the same day at sites only a few miles apart. Conditions at and following treatment were generally similar. Soil condition and moisture were not limiting.

At the first assessment (three weeks) the benthiocarb mixtures and, to a lesser extent, the propachlor mixture were inferior on the soil higher in organic matter (Trial 2).

At the second assessment (seven weeks) all treatments showed a decline in weed control, the decline being more marked on the soil high in organic matter (Trial 2). At both sites the decline was most marked in the benthiocarb mixtures.

TRIAL 3

Maize var. PX 610 was planted on November 17. Treatments were applied to moist soil on November 18 and 0.78 in. of rain fell in the following two days.

TABLE 3: PRE-EMERGENCE APPLICATION, MONAVALLE,
HAMILTON
(Soil OM—42%)

Treatment (lb)	Rating*		Yield (bu/ac)
	3 wk	11 wk	
benthiocarb 2.5	5.8	1.1	69 bBC
benthiocarb 5.0	5.8	1.8	90 bB
propachlor 5.8	9.3	3.7	138 aAB
alachlor 2.5	8.8	4.2	147 aAB
alachlor 5.0	9.5	6.1	160 aA
Control	1.0	1.0	24 cC
CV			23%

*Annual grasses plus redroot (*Amaranthus hybridus*), fathen (*Chenopodium album* agg.), black nightshade (*Solanum nigrum*) and willow weed (*Polygonum persicaria*).

At three weeks, propachlor and both rates of alachlor were giving complete grass control. Benthiocarb was inferior, particularly on the broadleaf species. The residual effectiveness of all treatments declined but not as rapidly as may have been expected on a soil of 42% OM. Alachlor was apparently the least affected.

DISCUSSION

In these trials the predominant grass weeds encountered were summer grass, witchgrasses, barnyard grass (*Echinochloa crus-galli*), and some crowfoot grass (*Eleusine indica*). One unreported trial had a heavy infestation of rough bristle grass (*Setaria verticillata*).

In the post-emergence trials, alachlor/atrazine gave the best weed control. There was some response to rate increment on high OM soils. Propachlor/atrazine at the rate tested was inferior to alachlor/atrazine.

Benthiocarb/atrazine was initially comparable to alachlor/atrazine on the low OM soil (10%) but control was less persistent. On the 21% OM soil, performance was inferior at all stages. It would appear that benthiocarb is inherently less persistent than alachlor and also more susceptible to organic matter adsorption.

Atrazine alone (4 lb) failed to give adequate grass weed control.

Pre-emergence applications of propachlor and alachlor gave excellent initial control of grasses on a soil of 42% OM. Decline in residual activity was faster than on a soil of 10% OM.

Practical experience indicates that with pre-emergence applications soil moisture is more likely to be a significant limiting factor than soil organic matter. Also on soils high in organic matter the extra time gained by an early post-emergence application is an advantage. Commercial experience indicates that early post-emergence application is practicable on a farm scale.

Unfortunately, the trial areas suffered damage from wind and lambs, giving rise to inconsistencies in the yield data.

CONCLUSIONS

Alachlor/atrazine (2.5/1.6 lb) and benthocarb/atrazine (5.0/1.6 lb) gave satisfactory weed control on a moist soil of 10% OM. Alachlor/atrazine (3.0/1.6 lb) was satisfactory on a moist soil of 21% OM.

Soil organic matter definitely reduced the residual activity of all herbicides. However, its influence did not appear to be of great practical significance, particularly when viewed in relation to the importance of soil moisture.

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REFERENCE

Cumberland, G. L. B.; Matthews, L. J.; Honore, E. N., 1970: *Proc. 23rd N.Z. Weed & Pest Control Conf.*: 31.